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AUTHOR Tracy, George S.; Baer, Michelle
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ABSTRACT

A study was conducted to answer the following questions: (1) What intellectual abilities are essential in a successful vocational training program? (2) To what degree can intellectual abilities be used to predict successful job placement? and (3) To what degree does rationale of job preference affect successful job placement? The assessment instrument used in the study was the Structure of Intellect (SOI), a program and curriculum developed according to a formal theory of intelligence. SOI identifies the characteristics of intelligence in terms of three dimensions: operations (how the individual thinks); content (the type of information presented); and products (the manner in which the information is organized). The SOI assessment was administered to five groups: students currently enrolled in vocational technical licensed practical nurse (LPN) training programs; vocational-technical students who had dropped out of LPN training programs; graduates of vocational technical programs who were practicing LPNs; currently enrolled vocational-technical students in welding programs; and practicing nurses aides. The study showed the SOI to be a useful instrument in determining patterns of intellectual abilities necessary for functioning successfully in a specific vocation. However, many other factors, such as interests, personality, and motivation, relate to success on the job. Based on the study, the researchers infer that the SOI is most useful in screening individuals into training programs to provide direction to remediate deficiencies and maximize strengths. It is not possible to determine the efficiency of the SOI in predicting job performance from this limited study. (KC)

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FINAL REPORT

CORRELATING INTELLECTUAL ABILITIES WITH SUCCESSFUL VOCATIONAL TRAINING AND PLACEMENT OF LISCENSED PRACTICAL NURSES USING THE STRUCTURE OF INTELLECT ASSESSMENT PROCEDURE

Evcon, Inc.

November 20, 1979

George S. Tracy

Michelle Baer

CE 026 704

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I. INTRODUCTION

This study attempts to answer the following questions:

1. What intellectual abilities are essential in a successful vocational training program?

2. To what "degree" can intellectual abilities be used to predict successful job placement?

3. To what "degree" does rationale of job preference affect successful job placement?

In view of the large number and diversity of training offerings by the state's vocational education programs, the Liscensed Practical Nurse (LPN) training sequence was selected for specific study. This study falls into the realm of a vigorous dialogue presently being explored by researchers in the area of defining and assessing intellectual abilities and their relationship to vocational success.

Guildford (1950) was one of the first educational psychologists to formulate a model to indicate the structure of one's intellect. His model is a three-way classification of intellectual abilities designed to encompass and organize intellectual aptitude factors.

Bloom (1956) and this associates identified and sequenced six areas of cognitive ability. Bloom's Taxonomy (1956) although originally intended as a classification of educational goals, does represent a useful inventory of cognitive abilities which can be used to assess one's level of cognitive reasoning and thinking.

Christensen (1963) conducted research with human thinking characteristics and basic skills of Guildord's Model of the Intellect. Christensen attempted to emphasize the potential application of Guildford's Model:

> "What is not always recognized in this period of rapid change is that although situations change, task requirements change, subject matters change, and technology changes most....human thinking characteristics and basic skills remain relatively the same and we know that each individual himself varies in his abilities only within specifiable parameters."

Implied in Christensen's research is the possbility that abilities of individuals as identified and defined by Guildford are somewhat fixed.

However, Meeker (1969) discovered that certain intellectual abilities exist among a multitude of individuals and many individuals do not possess all abilities. Meeker developed a structure which can be used to separate, describe, and measure those functions employed by humans engaging in productive intellectual ability. Thus, the "application" of one's intelligence depends upon the growth of these functions (abilities). Meeker found that failure (in school) of many students can be directly attributed to the fact that the students have not developed requisite abilities for success. She also found many intellectual failures can be remediated by direct training in the prerequisite intellectual skills. Meeker's results apply to students enrolled in academic programs and to students enrolled in vocational training programs.

Based upon the premise that certain intellectual abilities should be more basic to particular vocations than others and students most often "fail" because of lacking prerequisite abilities, this study attempts to identify, match, and predict job success of students in vocational training programs. This is to be accomplished by analyzing and correlating intellectual abilities with vocational training and placement. However, there are many factors other than intellectual abilities that determine vocational choice. In the present case we find that many LPN students may be dropping out of the program because it is not challenging enough. This is reflected by the pattern of raw scores in seven of the thirteen subtests used in the analysis.

Structure of Intellect (SOI)

SOI is a program of assessment and curriculum developed according to a formal theory of intelligence (Guildford, 1950). SOI provides an "x-ray" view of one's intelligence. This "x-ray" view identifies the characteristics of

intelligence in terms of three dimensions:

1) (operations) How the individual thinks

2) (content) The "type" of information presented

3) (products) The manner in which the information is organized

The complete SOI system is represented by a three dimensional classficiation array of 120 intellectual (cognitive) abilities. Thus, a unique definition can be obtained for each category by simply specifying its characteristics in terms of the above three major dimensions--operations, contents, and products.

Upon identification and isolation of the SOI intellectual abilities one can use this data in curriculum development, in the assessment and correction of learning and developmental problems, and in intelligence testing. Identification and teaching of these specific intellectual abilities is aimed at the achievement of a fundamental goal of education--to teach students how to learn.

It is now possible using the SOI program, to assess the abilities of an individual within each of these intellectual operations. This assessment of an individual's intellectual ability is necessary in vocational training and selection due to the fact that certain specific intellectual abilities are more basic to particular vocations than others. Thus, once correlations have been established between selected vocations and required intellectual abilities, one can assess the intellectual abilities of an individual and use this assessment data to better predict the individual's success with a given vocation. In addition, if the assessment indicates that the individual's abilities are abnormally weak, then intellectual tasks can be developed to remediate or enhance specific intellectual skills. This is possible because the specific tasks of each intellectual ability have been expressed by the SOI program, as precise teaching objectives.

In summary, the identification and isolation of the ways of operating intellectually can be used to assess an individual's intellectual abilities, provide remediation for those individuals with specific weak abilities, assist in determining a list of vocations which are best suited for an individual's intellectual ability, and assist in predicting an individual's success with a vocational training and placement program.

Counseling and guidance are an integral segment of any vocational training program. However, much of the assessment data obtained by the counselors is reported in terms of a grade equivalence (GE) or an intelligence quotient (IQ). Both of these measures answer the question: "Intelligence? How Much?" Thus, when a student in a vocational training program fails to learn, an IQ or GE index (number) on the student's personal folder neither explains nor accounts for this failure. This is due to the fact that education has never had a formal theory of intelligence. Thus, curriculum, academic and/or vocational, and IQ tests have never been organized according to a formal theory of human intellectual functioning. We can no longer be satisfied with the notion that intelligence is a simplicity which can be expressed as "how much". We need to ask: "Intelligence? What Kind?"

Today it is common practice for those who speak on behalf of disadvantaged students to be against IQ testing in the schools. The basis of this opposition is familiar: A student is tested; the test may be, for a variety of reasons, inaccurate, and the test results often characterize the student as being "below normal" in intelligence. This characterization functions as a label which goes to the teacher and prompts attitudes and treatment that may be inappropriate and false and even worse, are subtly (or otherwise) transmitted to the student. The student, in turn, tends to reflect behavior that fulfills the teacher's expectations. In short, if the teacher tells Johnny he is below average and if the teacher treats him as such, Johnny will respond accordingly,

indicating that the practice of testing is little related to the reason for testing and the test results are not used appropriately, i.e., as a diagnostic instrument for the purpose of curriculum development.

To correct this problem many representatives of the disadvantaged propose abolition of IQ testing which is well intended, but ill conceived. For to deny teachers access to formal assessments is to force them to make informal assessments that are subject to the same sorts of deficiencies. These assessments, not being exposed to scrutiny, are not open to easy identification and correction. This also denies the need for formal assessments that some students must have to meet legislated qualifications in many special programs of various schools.

Still the inescapable conclusion is that deficient assessments of IQ tests are almost uniformly insufficient, if not detrimental, for the ensuing instruction. The problem is not the potentiality of error, so much as the fact that the assessment is so general in kind that, as a consequence, it bears little relation to treatment. But, if assessments were specific and prescriptively related to treatement, there would be considerably less chance that errors, when they do occur, will be perpetuated.

All of this serves as an extended prologue to considering the school psychologist's response to requests for classroom teachers for professional assistance. However, the response must not be as general, global, and unrelated to instructional treatment as is the IQ score.

Meeker (1973) offered an analyses to illustrate the potential utility of specific ability assessment in the understanding of intelligence beyond the use of a general IQ score. To reiterate: Most studies have used the general IQ score as a basis for the reported findings. Meeker's study indicated the IQ score alone, may be misleading, e.g., disadvantaged blacks, if given opportunities and experiences to work with their strong categories before they are exposed

to the categories they are weak in, will develop feelings of success, good self-concept, and confidence which go a long way in helping them through the rough spots they will have to face in the handling of their weak categories.

The problem is further compounded by the fact that the teachers without this knowledge may give heaviest weighting to those weak categories, which is unfortunate for the disadvantaged student. For if the weak categories were parceled out of the IQ score through the accumulated totals profile, one could predict these disadvantaged students who score low on general IQ tests would score average or above average in intelligence. Thus, the psychologist could now make the test results relevant to the educational needs of the student. The teacher will feel he/she has had help because they can organize tasks to correct these noted deficiencies and thus can give the student school experiences which will make him feel successful so that a very necessary condition for the learning of difficult material is fulfilled or accomplished. The Structure of Intellect model (SOI) offers a sequence for the development of curriculum both horizontally and vertically. Moreover, the horizontal order of presentation of materials allows the teacher to provide learning sequence; i.e., if the student that is strong is given intellectual ability then he can be presented material which capitalizes on his strength; thus, a lesson in which he may be less capable, can be presented next. Thus, the SOI becomes much more than a neat task analysis system for presenting of subject matter. That is, the SOI materials develop intellectual strengths by using traditional subject matter as the vehicle.

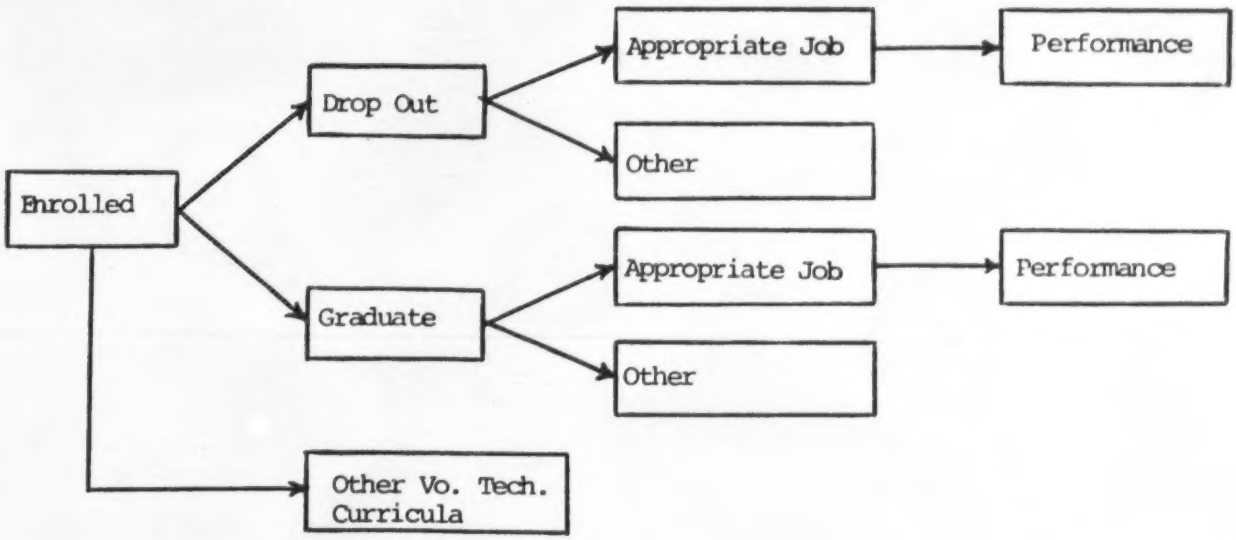
All of these findings have implications for any type of instructional program -- academic and/or vocational. Although the implications are numerous, this research study attempts to identify the specific categories of intelligence which are required in the performance of tasks for the selected vocations. For once the categories of intelligence have been matched to vocations, then through

assessment of students with SOI, it will be possible to provide meaningful insights into the potentiality of a student with his "chosen" vocational program. Thus, the counselor will be able to provide the student with specific, relevant assessment data. The counselor and student will be able to see if the vocational program selected by the student is the one that best "matches" his intellectual abilities. If it does not, then the counselor and student will know his (the student's) latent weakness. Thus, with careful guidance the student and the teachers in the vocational training program can use this data to develop the weak areas so the student may be more successful in his training program. In addition, if for one reason or another, the student does not wish to spend the time enhancing his weak areas, the counselor with the SOI assessment can assist the student in the selection of a vocation that provides the best "match" of the student's intellectual abilities to a given vocation. Thus, the vocational school will be able to provide its students with a program that for years many schools sought to attain: A personalized and individualized base for the selection and presentation of instruction.

II. METHODOLOGY AND ANALYSIS

As shown in figure 1, five groups were administered the SOI assessment instrument: students currently enrolled in vo-tech LPN training programs; vo-tech students who had dropped out of LPN training programs, graduates of vo-tech programs who were practising LPNs, currently enrolled vo-tech students in welding programs, and practising nurses aides. A vocational performance analysis form, appendix 1, was also completed by supervisors of practising LPNs. Nurses aides and welding students were included in the sample to determine if the SOI test discriminates between and within career clusters.

Figure 1: Sample Design



SOI Subtest Interpretation--Comprehension

Of the 24 subtests on the SOI-Learning Abilities Test, the following were determined to be significant in predicting successful performance as a Liscensed Practical Nurse.

Six of the subtests were in the cognition (comprehension) operation. Comprehension is a critical ability for understanding and following routines, directions, and instructions. People who make average or lower comprehension scores will need frequent and repeated instruction on a job when they are first learning. The instructions should be given frequently and in small steps. Low scores in comprehension should always try to work with patient supervisors. Low scorers will also work better in structured, repetitive tasks where they do not have to change routines too frequently during the day.

A higher than average comprehension score will characterize rapid workers who catch on quickly. These are people who work best in jobs where there are many things to do in a variety of ways or they will be bored. Because they understand so quickly, they like fast-paced, changing tasks. They may not even wait for instructions to be completed before they begin. Thus they sometimes seem impulsive because they want to get to the job and finish it quickly.

Each of the 6 subtests measure a different kind of comprehension.

1. VISUAL CLOSURE (CFU) (The average CFU raw score for adults is 11.) This test will indicate how comfortable one will be in jobs requiring sustained reading related activities or jobs which depend on one's ability to do visual tracking. It identifies whether one is able to pull the visual perimeters of an object together into a whole. It is a cognitive measure of the physiological adaptability of the eye. Many jobs require good vision and many people do not succeed in these jobs simply because of visual stress when they are otherwise well qualified for the job.

Mean Raw Scores

LPN Working 11

LPN Dropout 11

LPN Student 9

2-3. CONSTANCY OF OBJECT IN SPACE - (CFS) The adult average raw score is 22.

SPATIAL CONSERVATION - (CFT) The adult average raw score is 13.

These two tests measure one's ability to process spatial information in space (CFS) and to conserve that information from any perspective. A low score in comprehending spatial systems indicates that one has difficulty in orienting objects in space. This is an ability which is critical for success in vocations or careers where advanced mathematics such as geometry, trigonometry, calculus, physics and physical science careers are involved.

A low score in comprehending spatial perspective may indicate problems in understanding how objects in space are manipulated and transformed. The ability to comprehend shapes in a system no matter what perspective or dimension is viewed includes an ability to transform objects and adds a dimension of creativity.

Mean Raw Scores

	(CFS)	(CFT)
LPN Student	18	10
LPN Dropout	17	12
LPN Working	13	7

4. ARITHMETIC AND LANGUAGE VOCABULARY CONCEPTS - (CMU) The adult average raw score is 13.

Vocabulary measures the understanding of the meanings of words. We are very familiar with vocabulary tests because almost every test one has taken is heavily weighted with vocabulary. The first 15 items measured one's understanding

of arithmetic concepts and ideas (not computation; this is covered in CSS, ESS, and NSS). One could be very high in these rote arithmetic facts and not comprehend math vocabulary well enough to be able to solve word problems. Others may understand the ideas behind arithmetic but have low computation skills. High concepts, low computation people are good at different kinds of jobs than are high computation, low concept people. The second fifteen words measured reading and spoken vocabulary.

College entrance exams, success in college and success in graduate school are affected mostly by, and success depends mostly upon, a large vocabulary. All vocations and careers have an indigenous vernacular. To communicate these ideas clearly requires vocabulary.

Mean Raw Scores - (All are above average)

LPN Dropout	22
LPN Working	21
LPN Student	20

5. COMPREHENSION OF VERBAL RELATIONS - (CMR) The adult average raw score is 19. This test will indicate how well one understands how words and ideas are related. If one is accomplished working with verbal relations he probably has a good vocabulary. Vocabulary and the way the words are related are good indicators of success in jobs which depend on reading and working with words and ideas.

If the verbal relations score is low, one's ability to comprehend how words and ideas are, or can be related, will slow his understanding instructions when learning job routines. Careers which require communication of ideas and abstract thinking using words and ideas will be affected by a low ability in CMR. CMR depends upon CMU, vocabulary, of course. You need this

ability to understand why there are specific reasons for the work you do. A high score on this test will indicate that one's ability to work with verbal ideas is good.

Mean Raw Scores - (All above average)

LPN Dropout 22

LPN Working 21

LPN Student 21

6. COMPREHENSION OF A LONG SERIES OF IDEAS - (CMS) The adult average raw score is 16 This tests the ability to comprehend a series of ideas in order to follow directions.

A low score here means one needs to have instructions and directions given in short sentences. Learn to ask someone to repeat instructions in one short sentence at a time; learn to repeat what was told to be sure the directions were understood. If one is low here, he needs to work with people who are very patient because he needs much explanation and repetition. Students who score low in CMS often have had difficulty making good grades in high school and college. They do not perform as well in a job where being able to follow orders quickly given only once is a major part of the job.

Mean Raw Scores - (All below average)

LPN Working 15

LPN Dropout 15

LPN Student 15

SOI Subtest Interpretation--Memory

Four of the subtests were in the Memory operation. Memory is defined as the ability to commit information to storage for exact retrieval and also involves concentration and attending skills. Memory skills can be easily trained.

1. VISUAL MEMORY FOR DETAILS - (MFU) The adult average raw score is 17.

This test indicates how well one notices details and things in the environment when he is not specifically concentrating on them; it is a measure of incidental or peripheral Memory. When this ability is not well developed, one may not pay much attention to details in a job, even though his comprehension abilities may be very high. Undeveloped ability here can penalize one in jobs requiring him to keep track of many extraneous details and lead one's supervisor to think he is irresponsible or not really "with it". If the next 2 memory abilities are also low, it is best not to rely on vocal instructions, but rather to write, and ask others to write memos as reminders.

A low score for remembering incidental details often indicates that one does not pay attention to small details. The mean raw score for all three groups tested were extremely low.

Mean Raw Score

LPN Dropout	10
LPN Student	10
LPN Working	8

2 & 3. AUDITORY ATTENDING, CONCENTRATION, AND SEQUENCING

MSU - The adult average raw score is 16.

MSS - The adult average raw score is 16.

Attending, concentration, and sequencing information one hears are modal abilities which are basic sub-structures for most jobs. A high score indicates greater ability to pay attention and to concentrate on auditory details and to hold them in mind while working with them.

One's intellectual pattern often determines his working patterns. For example: high auditory memory with low visual memory will identify the auditory person (about 12-15% of people tend to learn more quickly when material is presented vocally for internalizing of information). These people will work best with auditory directions and explanations.

All three groups scored at or near the ceiling level on these two subtests.

Mean Raw Score

	(MSU)	(MSS)
LPN Working	18	18
LPN Dropout	18	17
LPN Student	18	18

4. MEMORY FOR INFERENCES AND IMPLICATIONS - (MSI) The adult average raw score is 8. This ability is one in which few people excel. If one's score is low, he will not enjoy working with highly abstract, unrelated data or analytical, discovery type research. This is an ability to store long bits of abstract, implied information for retrieval. Good ability here leads one to enjoy careers with exploratory aspects to them where one works with unrelated and abstract information rather than in jobs that are more routine and predictable.

Mean Raw Score - (All above average)

LPN Student	12
LPN Dropout	11
LPN Working	10

SOI Subtest Interpretation--Evaluation Operation

Two of the subtests were in the Evaluation Operation which measured abilities to make judgments, to plan efficiently, to make good decisions, and to have foresight.

Executives, supervisors, foremen, administrators score high in these abilities and if they have likeable personalities, they are usually successful in their jobs.

1. VISUAL DISCRIMINATION - (EFU) The adult average raw score is 19. This subtest measures the ability to make discriminations and judgements about detailed data. If one scores low here, he may need a visual test if the CFU score was low also. Low EFU visual is demonstrated when one mistakes d or p or transposes and reverses letters. One can see how this will cause him to make mistakes in typing, cashiering, assembling, computer programming, and bookkepping jobs. A low score here will predict that one will not enjoy jobs which requires making decisions about detailed information.

Mean Raw Score (All below average)

LPN Student	17
LPN Dropout	15
LPN Working	13

2. JUDGMENT OF ARITHMETIC SIMILARITIES - (ESC) The adult average raw score is 18. This subtest measures how well one conceptualizes symbolic or numerical material.

The test measures functioning in classifying numerical concepts using rote arithmetic facts. A low score indicates you will have difficulty organizing numerical or symbolic data.

If the score is higher than 18, the computer analysis will suggest for consideration which jobs need this skill. One will be able to organize numerical data efficiently and show good judgement in selecting appropriate procedures for providing data for problem-solving tasks.

The group of LPN working nurses were below average in this subtest.

Mean Raw Scores	
LPN Dropout	21
LPN Student	21
LPN Working	17

SOI Subtest Interpretation--Convergent Production

Two of the subtests were in the Convergent Production (Problem-Solving) Operation and reflect the ability to produce correct answers to problems where "solutions" are more complicated than mere memory retrieval.

These tests indicate how well one can generate new information from given information. These abilities also reflect one's general working skills and production abilities. If one can solve problems where the answers are known, he will like jobs which are predictable, where the work load is well documented and completed objectives are known ahead of time. He will enjoy jobs which do not require him to be highly flexible and adaptable.

If convergent problem solving abilities are low, one may find that no matter how intelligent he is, he has a hard time keeping a job because his working skills are not well developed. One must ask himself if he can stay with a responsible job until it is completed, and make certain the work is done correctly.

1. SPEED IN RECOGNITION OF DATA - (NST) The adult average raw score is 148. This test indicates how rapidly one reads or scans items and words. People with low scores will probably not like jobs where a lot of reading is required and so might prefer outdoor jobs where concentration is required or might prefer outdoor jobs where concentration spans are less important.

   A low score on this also suggest that if CFU and EFU are low, visual discrimination is poor and/or one may have poor vision. Again, this indicates a need for examination and correction before one tries for jobs which will demand using the eyes constantly.

Mean Raw Score

LPN Dropout	148
LPN Student	132
LPN Working	108

2. FORM REASONING (LOGIC) - (NSI) The adult average is 17.

This test indicates skill in making decisions which depend on logic. If the score is low and it is one's preference to let others diagnose and solve problems, then he will be happier in routine jobs where the duties are clearly delineated. If one has good working habits and is dependable there are many good jobs waiting to be filled.

High scores indicate good reasoning and logic. These are intellectual characteristics which when high, usually lead experienced workers into advancement because of the excellent logic used in solving problems and making good decisions for work. Those people will make good supervisory planners and managers. If one is low in this ability, he will prefer to work with people who are high logic thinkers because he will feel more secure.

Mean Raw Score	
LPN Dropout	19
LPN Student	17
LPN Working	13

SOI Subtest Statistical Analysis

Two general procedures were employed to analyze the data on the 16 SOI scales. The first utilized a linearized discriminant function to determine the appropriate classification of five occupational/student groups based on each individuals SOI score profile. The second procedure utilized was a multiple-regression analysis in which performance evaluation on each of the 12 scales for working individuals were regressed on 15 SOI scales. Each of these procedures will be discussed separately.

Discriminant Analysis:

A. Working LPNs and NAs

The results of the discriminant analysis for working LPNs and NAs are given in Table 1. The results are based on equal a priori classification probabilities because it was believed that the potential number in each group for such a population would be about equal. (It must be remembered that the data do not constitue a random sample from some total population but is essentially a convenience sample.)

Of the total numbers in the two groups, better than 80% were properly classified - i.e., the posteriori probability of classification into a particular group was high for the group in which they were actually located. There were 10 classification "errors", that is the analysis put them into the other group or their assignment was equivocal. One LPN and two NAs had almost equal classification probabilities for either group. Three LPNs and four NAs were badly classified in that the LPNs should have been NAs and vice versa.

An examination of the mean values for the SOI scores for these two groups reveals only five significantly different score means ($p < .1$) and one difference at $p < .06$. Acting together as a 16-dimension random variable, however, the SOI scores differentiate quite well between the two groups.

B. LPN Dropouts and Working LPNs

The results in Table 2 indicate that 12 subjects, about 27%, would be classified out of their present category. Of the five LPN Dropouts who were post-classified as LPNs, three should have remained in school at least on the basis of their SOI scores and two were borderline. Five of the seven LPN post-classified as dropouts were borderline and two clearly should have been advised to drop out. All post-classification probabilities for the "correctly" classified were quite

TABLE 1

CLASSIFICATION OF WORKING L.P.N.'s and N.A.'s
by LINEARIZED DISCRIMINANT FUNCTION*

In This Occupation	Classified Into This Occupation	
	LPN	NA
LPN	23	4
NA	6	27

"Error" of classification = $\frac{6+4}{60} = \frac{10}{60} = 16.67\%$

"Errors"	Number	Comment
From --- To		
LPN ---- NA	1	Too close to call
NA --- LPN	2	Too close to call
LPN --- NA	3	Very badly misclassified
NA --- LPN	4	Very badly misclassified

* There are significant differences between LPN's and NA's as measured by a 16 - dimension random variable (SOI scores). All four of the following criteria test the same hypotheses at probability less than .01: Hofelling-Lawley Trace, Pillai's Trace, Wilk's Criterion, Roy Maximum Root Criterion.

TABLE 2

CLASSIFICATION OF L.P.N. DROPOUTS AND WORKING L.P.N.'s
BY LINEARIZED DISCRIMINANT FUNCTION.*

In This Occupation	Classified Into This Occupation	
	LPN Dropout	Working LPN
LPN Dropout	13	5
Working LPN	7	20

"Error" of Classification = $\frac{5+7}{45} = \frac{12}{45} = 26.67\%$

"Errors"	Number	Comment
From - To		
LPN Dropout -- LPN	5	3 should have stayed with LPN 2 too close to call
LPN -- LPN Dropout	7	5 too close to call 2 should have been advised to dropout

high. It is probable that most of the actual dropouts were for reasons other than academic ones, which seems to readily account for the LPN Dropouts who were post-classified as LPN, or at least three of those five. It should be noted that MSU scale was dropped from this analysis because in both groups all individuals had a score value of 18 with no variance.

C. All Five Groups (Working LPNs, Student LPNs, Dropout LPNs, Working NAs, and Welders)

When all groups are put into the analysis simultaneously, a more complete picture emerges, Table 3. The most serious "errors" of post-classification occur in the fifth column and fifth row of the table (welders) because in those instances the para-health individuals were classified in the welder category and vice versa. The total in those categoreis represent about 17% serious "errors" of classification.

In summarizing the results of the discriminant analysis, it must be remembered that this analysis essentially locates each individual in a 16-dimension space. Each individual is then compared to all others in terms of a generalized distance function which is then utilized to group him with a specified probability with those he must closely resembles in terms of his location in that 16-dimensional space. The term "errors of classification" simply means, for example, that 4 welders more closely resemble student LPNs in their profile than any other group (1st column, last row of Table 3). In general, the SOI scales seemed to predict fairly well, although specific aspects of individuals' profile would have to be examined to understand underlying reasons for changed classification. The LPN Dropouts are interesting because 11 of them (61%) were post-classified into a LPN category, indicating that a good proportion of dropouts are for other than academic reasons.

TABLE 3

CLASSIFICATION OF ALL FIVE GROUPS
BY LINEARIZED DISCRIMINANT FUNCTIONS.

In This Group	Classified Into This Group				
	Student L.P.N.	Dropout L.P.N.	Working N.A.	Working N.A.	Welder
Student L.P.N.	34	14	7	5	5
Dropout L.P.N.	6	3	5	0	4
Working L.P.N.	2	5	15	3	2
Working N. A.	2	2	4	18	8
Welder	4	1	2	4	23

Multiple Regression Analysis:

A 12-item performance rating scale was secured from the supervisors of the working LPNs and NAs. A multiple regression using the general linear model procedure regressed each performance item separately on 15 SOI scales simultaneously - i.e.,

$$P_1 = B_o + B_1 (SOI)_1 + B_2 + \text{--------} B_{16} (SOI)_{16}$$

$$P_L = B_o + B_1 (SOI)_1 + B_2 + \text{--------} B_{16} (SOI)_{16}$$

The MSU scale $(SOI)_9$ was not included because, again, for two groups there was no variance in this scale.

In no instance, in this analysis, was significance for the linear model found. In several sporadic cases the B weights were significant but the overall F test for the model was not significant. At this point, therefore, there is no evidence that the SOI scales can "predict" performance on the job.

III. CONCLUSIONS AND RECOMMENDATIONS

The SOI has shown to be a useful instrument in determining patterns of intellectual abilities necessary for functioning successfully in a specific vocation. Many factors relate to success on the job. Intelligence is only one of these factors. Interests and personality are also important for success on the job, but they have more to do with social skills, emotional adjustment and temperment characteristics. Motivation is even more important and probably the most difficult to assess. Based on this study we believe that the SOI is most useful in screening individuals into training programs to provide direction to remediate deficiencies and maximize strengths.

From this limited study it is impossible at this time to determine the efficiency of the SOI in predicting job performance. This area requires further sophistication on measures of performance, and is confounded by the interaction of many work site variables. It is recommended that a similar procedure be adapted for an entire career cluster in order to predict levels of intellectual abilities which may be prerequisites for completing training for specific vocations.